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U. S. DEPARTMENT OF AGRICULTURE.

FARMERS' BULLETIN 353.

Experiment Station Work, L.

Compiled from the Publications of the Agricultural Experiment Stations.

COMMERCIAL CLOVER SEED.
DODDER IN ALFALFA SEED.
GROWING POTATOES UNDER STRAW.
HENS VERSUS INCUBATORS.
PREPARING FOWLS FOR MARKET.
PRESERVATION OF EGGS.
THE MOUND-BUILDING PRAIRIE ANT.

COAGULATION OF MILK IN CHEESE
MAKING.
EFFECT OF ALKALI ON CEMENT
STRUCTURES.
SILO CONSTRUCTION.
A CHEAP AND EFFICIENT STERILIZER.
A CHEAP AND EFFICIENT ICE BOX.
THE POWER LAUNDRY FOR THE FARM.

JANUARY, 1909.

PREPARED IN THE OFFICE OF EXPERIMENT STATIONS.

A. C. TRUE, Director.



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EXPERIMENT STATION WORK.

Edited by W. H. BEAL and the Staff of the Experiment Station Record.

Experiment Station Work is a subseries of brief popular bulletins compiled from the published reports of the agricultural experiment stations and kindred institutions in this and other countries. The chief object of these publications is to disseminate throughout the country information regarding experiments at the different experiment stations, and thus to acquaint farmers in a general way with the progress of agricultural investigation on its practical side. The results herein reported should for the most part be regarded as tentative and suggestive rather than conclusive. Further experiments may modify them, and experience alone can show how far they will be useful in actual practice. The work of the stations must not be depended upon to produce "rules for farming." How to apply the results of experiments to his own conditions will ever remain the problem of the individual farmer.—A. C. TRUE, Director, Office of Experiment Stations.

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EXPERIMENT STATION WORK.^a

COMMERCIAL CLOVER SEED.^b

Clean soil and clean seed are essential to a clean crop. These requirements are especially necessary when the crop to be grown is of slow development in its earlier stages, as in the case of clover, alfalfa, and certain other, particularly the grass, crops. When land has been kept free from weeds and the seed bed carefully prepared it is readily realized how great a loss results when noxious weed seeds are introduced with the seed for a crop. As is pointed out by a recent bulletin of the Connecticut Station, there is frequently great danger of securing in the open market clover seed of poor quality, and the advice is given that purchasers make sure of the quality of the seed before buying. Of fifty-one samples of clover seed examined by this station three were heavily adulterated with black medie and only ten were apparently free from dodder, and two of these had a very low vitality. Only one-sixth of the entire number of samples analyzed was fit for use.

With reference to the weight of the samples, it is said that clover seed of average quality should weigh about 1.5 grams per 1,000 seeds, making about 302,000 seeds to the pound. Of the samples examined twenty-six did not reach this standard. Two weighed only 1.27 grams or less, equal to 363,000 seeds to the pound, while on the other hand two weighed 2.92 grams per 1,000 seeds, equal to 236,000 seeds per pound. Sowing a certain number of pounds of light seed per acre would put a greater number of seeds on the area than if the same quantity of heavy seed was sown, but under the same conditions the heavy seed would be more likely to give a satisfactory stand.

The vitality tests made under laboratory conditions showed an average vitality of 86.6 per cent for the fifty-one samples, or, in other words, an average of 86.6 out of every 100 clover seeds in the germination tests had life enough to produce a sprout. This result

^a A progress record of experimental inquiries, published without assumption of responsibility by the Department for the correctness of the facts and conclusions reported by the stations.

^b Compiled from Connecticut State Sta. Bul. 160. See also U. S. Dept. Agr., Farmers' Bul. 79, p. 17.

is regarded as satisfactory, although the vitality is but little above the provisional minimum of 85 per cent recommended by the seed laboratory of this Department for commercial clover seed. Twenty of the samples fell below 85 per cent, four below 75 per cent, and the lowest was 64.2 per cent.

The purity of clover seed is likely to be of greater importance than its weight or its vitality. While light or old and weak seed may be the cause of a partial failure of the crop, and generally does result in an imperfect stand, impure seed often produces a greater loss by noxious weeds introduced with it, and especially is this the case if it contains dodder, which often partly or entirely ruins a crop and which may stay in the land as long as the particular clover crop is grown on it. The average purity in this collection of samples was 90.5 per cent, or 7.5 per cent lower than the provisional standard of this Department, which is 98 per cent. The expression "98 per cent purity" means that of 100 pounds of seed bought 98 pounds are clover and the rest is dirt or foreign seeds. A botanical analysis of five samples showed the presence of at least thirty-five species of foreign seeds, including several kinds of dodder and total numbers of foreign seeds ranging from 12,458 to 78,604 per pound. Attention is called to the fact that if the foreign clover, alfalfa, and timothy seeds present, which range from about 2,500 to 35,000 per pound, are left out of account a seeding of 8 pounds per acre of any of these samples would plant from two to eight weed seeds on every square foot of ground.

Three samples of the lot were evidently adulterated. The first contained 21.2 per cent, the second 22.6 per cent, and the third as high as 39.1 per cent of black medic (*Medicago lupulina*), a leguminous plant of little or no value and apparently chiefly used for adulteration of red clover seed, the importations of which into this country frequently carry a very high percentage of this adulterant. The two kinds of seed are of about the same size and do not differ much in color, although black medic seed never has the purple or violet color of red clover seed. The medic seeds are also more oval in shape than those of red clover, which have a distorted heart shape, a roughly triangular outline with rounded corners.

The weed most dangerous and destructive to the clover crop is dodder, and the seed of this pest is about as large as small clover seed and very difficult to separate from it. In color it is light gray, yellowish or light brown, dull, finely roughened, but not pitted. Its method of attacking the clover plant is described as follows:

The seed of this weed germinates in the ground, sends up a thread-like stem, yellow or reddish in color, which immediately attaches itself to its host plant. If it finds no plant on which it can feed, it dies, being entirely a parasite. Finding a suitable plant, it twines closely around the stem or leaf, sends its sucking organs into the tissue, and lives on its juices, weakening or killing the host. Its connection with the ground

soon ceases, and when actively growing the stem may be cut into any number of pieces, each of which, if attached to clover, will continue to flourish. It flowers and produces abundant seed, which stocks the ground for the next clover crop. Clover infested with dodder lodges, mats together, can not be properly cured, and either because of the dodder present or the molding of the clover in consequence, has been known to scour cows when fed out as hay.

In twenty-eight carefully tested samples from 18 to 11,615 dodder seeds were found per pound of clover seed. It is pointed out that a seeding of 8 pounds per acre of these two samples would place one seed to every 300 square feet and two seeds to every square foot of land, respectively. From alfalfa seed the dodder seed may be separated by sifting in sieves made for this particular purpose, but owing to the small size of red clover seed this method can not be applied in cleaning it from dodder.

DODDER IN ALFALFA SEED.^a

The appearance of dodder in clover and alfalfa fields is generally most dangerous to the crop. The ordinary operations of mowing, raking, and hauling tend to spread this troublesome parasite, and with every new center of infection the chances of the crop grow less. A recent circular of the New York Experiment Station at Geneva describes the injury resulting from dodder in alfalfa fields as follows:

Dodder is a yellow, thread-like twining weed which is exceedingly troublesome in alfalfa fields. It appears in circular spots 3 to 30 feet or more in diameter. At the center of the spot the alfalfa is killed out, while around the margin the ground is covered with a mat of yellow threads which twine closely about the stems of the alfalfa plants and slowly strangle them. The spots increase in size from year to year. Many fields have been completely ruined by dodder. It is not often injurious to other crops (except red clover), but once established in an alfalfa field it is very difficult to eradicate without killing the alfalfa.

As dodder is usually introduced with clover and alfalfa seed, the purchase and use of dodder-free seed can not be too strongly urged. Clean seed, however, can not always be secured, and therefore cleaning the seed is often necessary. Frequently neither the purchaser nor the seed dealer knows dodder seed, and consequently in many cases the first proof of its introduction is the appearance in the field of the weed itself. In view of these facts, the New York Station recommends that seed be examined before it is sown to determine the presence of dodder.

Alfalfa seed is larger than dodder seed and advantage was taken of this fact by the station to perfect a method by which commercial alfalfa seed may be made practically free from dodder and safe to sow. It was found that dodder seeds are readily removed by sifting through a wire sieve having 20 meshes to the inch. Since ready-made sieves of this mesh are not readily obtainable, it is advised to construct a light,

^a Compiled from N. Y. State Sta. Circ. 8.

wooden frame 12 inches square by 3 inches deep and tack over the bottom of it 20 by 20 mesh steel-wire cloth of No. 34 Washburn & Moen gauge wire. (Fig. 1.) This quantity of wire cloth ought not to cost more than 15 or 20 cents. In case brass or copper wire cloth is used the wire should be No. 32 on the English gauge. It is im-

portant that the wire cloth used be exactly 20 by 20 mesh, which may be determined by placing a ruler on the sieve or cloth and counting the number of spaces to the inch. With a sieve of this kind it is estimated that a man can clean from 3 to 7 bushels of alfalfa seed per day. From one-fourth to one-half pound of seed, and no more, should be put into the sieve at a time and vigorously shaken for one-half minute. To make the work uniformly thorough the use of a cup holding not over one-half pound of seed and careful timing of the sifting is recommended. If the seed contains but little dodder one sifting may do, but

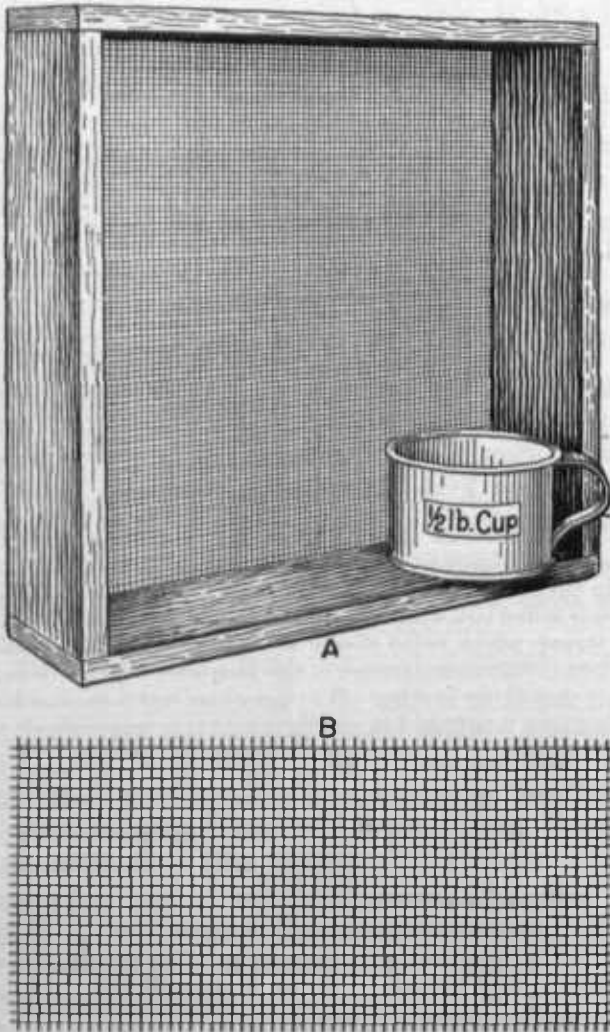


FIG. 1.—Tools required for sifting alfalfa seed to remove dodder seed: A, Home-made sieve 12 inches square by 3 inches deep; B, 20 by 20 mesh wire cloth made of No. 34 steel wire. (Natural size.)

when much dodder is present, and particularly if it is of the large-seeded kind, two siftings, both made strictly as directed, are advised.

In experimenting with this method it was observed that besides the dodder seeds various other small weed seeds, broken seeds, and dirt, as well as some of the smaller alfalfa seeds, were also removed by

sifting. The siftings varied from about 1 to 5 pounds per bushel, according to the original cleanness of the seed and the thoroughness of the sifting. The rejection of the siftings is considered as causing but little if any loss.

GROWING POTATOES UNDER STRAW.^a

In a previous bulletin of this series^b attention was called to the good results obtained by R. A. Emerson, of the Nebraska Station, in growing seed potatoes under mulch. Seed so grown was found to be, under the warm dry summer conditions of Nebraska, much better than that produced by ordinary methods of culture. Mulching was also found as a rule to increase the yield, and the results in general indicate that while mulching would not be practical on a large scale, on account of the large amount of mulching material needed and the cost of application, it is entirely feasible on a small scale, as for instance, when the farmer raises a few potatoes for his own table or when he wishes to raise a few seed potatoes.

The practice has much to commend it in hot, dry climates, as the mulch conserves the soil moisture, but is not so successful in a wet season unless the ground selected is well drained. Another reason for the use of mulches is that it saves cultivation in the busy season, and in this respect early mulching is preferable to late mulching.

A writer in *The Agricultural Gazette*, of New South Wales, says:

Perhaps no other field or garden crop is more benefited by a liberal mulch of wheat straw (or other litter) than potatoes, and especially is this the case with the second crop planted, say, in January. If the soil be well fined, the potatoes planted closely and covered shallow, and a mulch of from 1 to 3 or 4, or even 6 inches of straw applied immediately upon planting, good results are sure to follow. The potatoes will need no cultivation if the straw be applied at once before a packing rain. It prevents the packing of the soil by such a rain, breaking the force of the descending drops, and letting them down to seep slowly into the soil; and, intervening between soil and wind and sun, keeps it there, very largely, at least. It would be [a very] bad year if potatoes failed to do well under such treatment.

If every farmer who grows wheat will try the following plan he will, in a figurative sense, convert his wheat straw into potatoes: As soon as the stripper has harvested the grain, mow the straw with mowing machine or scythe and rake into windrows, with horse rake or otherwise. Immediately plow and harrow the land between the windrows, and plant the potatoes in the usual way, only they may be planted in rows closer together than the usual distance, in order to economize the mulch. Plant in shallow furrows, and cover with the harrow, leaving the land perfectly level. Cover at once with the mulch of straw to whatever thickness you have straw sufficient for, and the work is done. The potatoes will come up through the straw and flourish, and never be troubled by weeds. No further cultivation will be necessary. When the potatoes are gathered, many fine tubers will be found, not only in the soil and near the surface, but lying on the top of the ground just under the straw. * * *

^a Compiled from Nebraska Sta. Bul. 97; Agr. Gaz. N. S. Wales, 11 (1900), No. 1, pp. 46, 47; 19 (1908), No. 3, p. 104.

^b U. S. Dept. Agr., Farmers' Bul. 305, p. 8.

If wheat straw is not available for mulching potatoes, bushes, suckers, and green branches from trees laid thickly over the whole surface of the soil will be found a very good substitute.

It is to be noticed that the above was written for a country that is subject to periods of drought; also that January there corresponds to July in this hemisphere.

Another writer in the same journal describes an extreme type of the muleh method of growing potatoes, which may be used on heavy stiff lands not suited to potatoes, as follows:

The ground is plowed deeply and harrowed into a good state of tilth; the potatoes are then placed by hand firmly in the soil until they are about half covered; then 12 to 15 inches of wheaten straw is placed over them; this completes the planting. Nothing more is done until the potatoes are picked—not dug—from under the straw, for they lie on top of the ground around the seed set. * * * The straw forms a protection from the sun and other destructive agents, the same as the earth does when they are grown in the ordinary way.

This method of course commends itself only for small scale garden operations, but certainly has the advantages of ease and simplicity. Potatoes so grown can be easily removed from the hill from time to time as they mature.

A method of this kind has been used to some extent in certain parts of this country, where it is known as the "lazy bed." While convenient and economical of labor, it of course is not to be recommended except where better methods of culture are not feasible.

HENS VERSUS INCUBATORS.^a

The question of the relative merits of hens and incubators as a means of hatching chickens is of much importance to all who raise poultry on a scale at all extensive.

The person who raises only a small number of chickens will, as a rule, do better to use hens for hatching purposes, while the commercial poultryman, who must be able to have stock ready for market at different times, is practically compelled to use incubators. However, all studies of the relative efficiency of the two methods of hatching are of value since they may point the way for improvement in the artificial method of incubation, bringing it gradually nearer in results to the natural method.

The Oregon Station has recently made studies of various problems of incubation, and the results bearing on relative efficiency of hens and incubators are summarized as follows:

- (1) From 879 eggs set, incubators hatched 533 chicks, or 60.6 per cent.
- (2) From 279 eggs, hens hatched 219 chicks, or 78.8 per cent.
- (3) Eliminating eggs broken in nests, the hens hatched 88.2 per cent of eggs set.
- (4) The incubators hatched 78.5 per cent of "fertile" eggs, and the hens hatched 96.5 per cent.

^a Compiled from Oregon Sta. Bul. 100.

(5) Eggs incubated artificially tested out 22.7 per cent as infertile, while those incubated by hens tested out 11.8 per cent.

(6) The incubators showed 16.6 per cent of chicks "dead in the shell," and the hens 2.8 per cent.

(7) Chicks hatched under hens weighed heavier than chicks hatched in incubators.

(8) The mortality of hen-hatched chicks brooded in brooders was 10.8 per cent in four weeks, and of incubator-hatched chicks 33.5 per cent.

(9) The mortality in hen-hatched chicks brooded under hens was 2.2 per cent, and of incubator chicks 49.2 per cent.

(10) In other tests the mortality was 46.5 per cent for incubator chicks brooded by hens and 58.4 brooded in brooders.

(11) Hen-hatched chicks made greater gain in weight than incubator chicks, whether brooded by hens or brooders.

From these results Professor Dryden concludes that hens were more efficient hatchers than the incubators, though the incubators hatched a fairly satisfactory number of the eggs.

It may be true in practice that the incubator will hatch as many chicks, on the average, as the sitting hen, because the hen sometimes breaks eggs in the nest and sometimes quits her job, two things that the incubator is not guilty of, though occasionally the lamp will go out, the temperature will go wrong, and all the eggs will be spoiled. But this is a matter of care with the operator, and with fair care the loss from accidents will be less in the incubators than under hens. It may therefore be that an incubator properly attended will, on the average, hatch as many chicks from a certain number of eggs as a certain number of hens will hatch from the same number of eggs of the same kind.

Successful incubation, however, does not mean merely the hatching of a large percentage or a certain percentage of the eggs; the serious problem is not how to hatch the greatest percentage of the eggs, but it is rather how to hatch the largest number of chicks of greatest vitality. The test of the incubator is not that it hatch, on the average, as large a percentage of the eggs as the sitting hen, but that it hatch as many and as good chicks as a good sitting hen. Until this can be done poultry enterprises will continue to lag where artificial methods of incubation are used.

On the whole the results show that artificial incubation is responsible for the large percentage of chicks "dead in the shell," as well as for the large mortality of chicks in the brooder. There are doubtless brooder problems affecting the vitality of the chick, but this fact should not obscure the plain demerits of artificial incubation. * * *

That the incubator is the cause of the mortality in the chicks was demonstrated in two ways: First, when hen-hatched chicks and incubator-hatched chicks were put together in the same brooder, the former lived well and the latter showed a large death rate; and, second, it was demonstrated when hen-hatched chicks and incubator-hatched chicks were put together with the same hen or hens, the former lived well and the latter showed the usual mortality, or practically so.

In considering the relative profitableness of the two methods, account should also be taken of the relative cost of labor.

The figures given above show that there was a marked difference in weight of hen-hatched and incubator-hatched chicks. While the cause of this difference was not definitely determined in these experiments, it was found that the adding of moisture to the incubators increased the weight of the chick. Professor Dryden is of the opinion, however, that it is not a question of moisture alone, because he

found "that by increasing the moisture in incubators to such an extent that the eggs lost less weight than eggs under hens normally, the incubator chicks weighed less than the hen chicks, though the moisture increased the weight of the incubator chicks."

The proper handling of incubators is fully discussed in a Farmers' Bulletin of this Department.^a

PREPARING FOWLS FOR MARKET.^b

In continuation of his suggestions to amateur poultrymen previously noted,^c C. K. Graham in a recent bulletin of the Connecticut Storrs Station gives directions for preparing fowls for the market. He states that "the method of killing not only affects the plucking of the fowl, but will to a large degree affect the quality of the flesh."

Chickens should not be chased or excited before killing, as this is thought to have an unfavorable effect on the flavor and texture of the flesh. To avoid this it is well to have a catching hook such as is described in a former bulletin of this series.^d The best method of killing is probably by bleeding, and is described as follows:

Held the head of the bird with the left hand, back of the head up, keeping the hand on the back of the neck to avoid cutting yourself should the knife slip and pass through the top of the head. Take the knife in the right hand, the back of the blade toward your body. Insert the blade in the mouth, keeping the point to the right side of the bird's neck and as near the outer skin as possible until it is well past the neck bone. Then press the edge toward the bone and slowly draw the knife from the mouth, the hand moving from your body, so that the knife appears to pass across the neck. Repeat the process on the left side of the neck. This should cause the bird to bleed freely, but by holding the beak up the blood will remain in the neck, giving you plenty of time to pierce the brain. The latter is located just above the eye and can be easily reached through the upper part of the mouth by using a stiff steel blade, inserted in the mouth with blade edge up and pointing slightly over the eye. With young birds little trouble is experienced in piercing the brain, but with older birds a very stiff blade is required, as the bones are much harder. When the point of the blade enters the brain, give the knife a quick twist to right or left to widen the aperture. If the brain has been reached, the bird will attempt to squawk or will give a nervous jerk as the blade touches the spot, and this touching the brain or nerves not only loosens the feathers of the bird for dry plucking, but will greatly improve the appearance of scalded stock.

A weight, which may consist of an old tomato can half filled with stones and cement, is immediately attached by means of a wire hook to the lower mandible of the bird. "Then by grasping the wings close to the back, the bird will not be able to flutter, and can be easily and rapidly plucked. This, of course, should always be done while the bird is bleeding. * * * The can catches the blood, and by hanging the bird over a barrel the feathers may easily be saved."

^a U. S. Dept. Agr., Farmers' Bul. 236.

^b Compiled from Connecticut Storrs Sta. Bul. 52.

^c U. S. Dept. Agr., Farmers' Bul. 237, p. 22.

^d U. S. Dept. Agr., Farmers' Bul. 317, p. 31.

Since there is considerable difficulty in scalding birds properly and it is often improperly done, dealers usually pay a little more for dry-plucked birds.

The breast should be plucked first, starting near the crop. After the breast the thighs, then the back near the base of the tail, and last the wings. As soon as the feathers have been removed the wings should be twisted over the back and the bird taken from the hooks and the feet washed, after which the thighs and legs should be pressed to the body either by placing a brick on the bird's breast or by tying the body, the object of this being to give the bird a plump or blocky appearance.

The birds should not be allowed to hang until they become rigid, as that causes them to look thin. Care must be taken that all animal heat has left the birds before they are packed for shipment, but this does not mean that it is necessary for them to hang while cooling.

As a rule, the head and feet are left on and the entrails are not removed, but such details depend on the requirements of the market to which the birds are sent. The following directions are given for preparing drawn poultry:

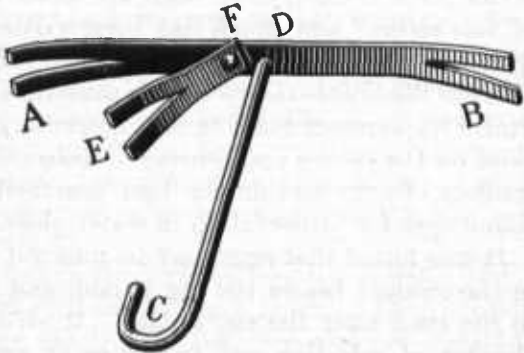


FIG. 2.—Hook used at Storrs Experiment Station to hold birds for plucking: A-B, bar; C-D, staff; E-F, arm.

Broilers.—Lay the bird on its side, draw the knife down the back, beginning between the shoulders near the neck, and cut through the backbone or along each side and remove the bone. Continue cutting past the oil sack and tail around to the end of the breastbone, then lay the bird on its breast. The entrails can then be easily removed, and the blood, if any, wiped out with a dry cloth.

Roasters.—Place the bird on its breast, head down. Inserting the point of the knife in the back just between the shoulder blades, continue the cut along the back of the neck to the head. Near where the blade first cut the skin will be noticed a white spot, which marks the joining of the neck to the backbone. By a little manipulation with the point of the blade the neck bone can be easily severed at this point. The oesophagus and wind pipe should then be separated from the skin of the neck, after which the head may be removed, making the separation from the skin of the neck as near the head as possible. The crop is then easily removed, and after being severed from the entrails, the latter, including the lungs, should be loosened from the frame of the bird by inserting the finger in this opening. The bird should then be placed with the vent up. Hold the vent with the left hand and cut around it, and in doing so loosen the main gut from the back of the fowl. In this way the entrails can be removed with little or no dirt, and through a very small opening.

Many consumers object to a roasted fowl on which the flesh has been drawn off the bones at the knee joints. This can be overcome by leaving a little of the yellow seal or shank on the back of the leg at the knee when removing the shanks.

All birds intended for roasting should have the sinews of the leg removed. To do this cut the skin of the shank lengthwise just back of the bone. With an eight-inch

screw-driver raise the sinews, and by a twist of the tool these may be parted. They can then be pulled easily by holding the leg and screw-driver as you would a bottle and corkscrew.

A convenient hook for holding fowls for plucking is shown in figure 2. The bar A-B is of quarter-inch iron 1 inch wide and 18 inches long, with a split 3 inches long and about three-fourths of an inch wide at each end. A 5-inch arm E-F is riveted to A-B $1\frac{1}{2}$ inches from D, making the distance from B to E about 15 inches and providing for fowls too small to spread from A to B. The staff C-D is of half-inch round iron 18 inches long with a shoulder at D and riveted on the under side of A-B, so that the latter will swing freely.

PRESERVATION OF EGGS.^a

The best means of preserving eggs, particularly methods in which water glass is used, have been discussed in several earlier bulletins of this series,^b and much has been written on this subject, but the question of securing eggs in the best possible condition for preservation has heretofore received little attention. G. H. Lamson, jr., of the Storrs Experiment Station, has, however, recently reported investigations on the causes and sources of infection which may result in the spoiling of eggs and on the best practical means of securing clean, sound eggs for preservation in water glass.

It was found that eggs may be infected with the bacteria of decay in the oviduct before the egg is laid, and through pores and defects in the shell after the egg is laid. Much can be done to reduce the chances of infection and to reduce or prevent the injurious effects of infection, thereby greatly improving the keeping quality of the eggs. In the first place the hens should be kept in as nearly perfect health as possible and should be given enough shell-forming food to enable them to make strong shells of uniform thickness.^c Clean nesting places are necessary to prevent infection in the nest. The eggs should be gathered daily and kept in a dry, cool room or cellar where the sun's rays do not fall directly upon them. Only clean eggs should be used for preservation and these should be placed in the preservative within twenty-four hours after they are laid.

Eggs laid during April, May, and early June were found to keep better than those laid at any other season. It is recommended, therefore, that only eggs laid at this season be preserved. It was found that water glass when properly made seals the eggs to prevent further infection and when kept at a comparatively low temperature prevents the multiplication of bacteria (decay) within the egg. Water glass can usually be obtained through druggists at from \$1 to \$1.25 per gallon, a gallon of the water glass being made into 10 gallons of

^a Compiled from Connecticut Storrs Sta. Bul. 55.

^b U. S. Dept. Agr., Farmers' Bul. 296, p. 29.

^c U. S. Dept. Agr., Farmers' Buls. 186, p. 26; 225, p. 26.

preservative by simply dissolving it in 9 gallons of water which has been boiled and cooled before use.

The preserved eggs should be kept in a cellar or room of even temperature which does not go over 60° F.

If care is taken to select clean, sound eggs, and proper precautions are observed in carrying out the details of the method of preservation as above indicated, it is believed that water glass furnishes a cheap, reliable, and easily employed preservative for domestic use, "and by its use everyone having a supply of fresh eggs in the spring can make a considerable saving, and at the same time have a larger number of fresh eggs to use in the winter."

THE MOUND-BUILDING PRAIRIE ANT.^a

In a recent bulletin of the Kansas Station, T. J. Headlee and G. A. Dean describe the prairie ant and the mounds they build and discuss their economic importance from an agricultural standpoint. It is shown that "while it is true that they destroy a small percentage of cultivated crops, their substantial claim to the title of injurious insects lies in the annoyance caused the farmer in cultivating and harvesting his crops and in the discomfort resulting from their efforts to protect their habitations when occupying public streets, sidewalks, much-used paths, dooryards, and corrals."

The ant mounds are found throughout western Kansas and the neighboring States, comprising the Western plains. They are sometimes circular, but usually elliptical at the base, and are from 2 to 6 feet in diameter and vary in height from a few inches to as much as 2 feet. The ants clear a circular space around their mounds, removing all vegetation from it to a distance of 5 to 10 feet from the mound on all sides; the mound is usually exactly in the center of the cleared space. The outside of the mounds is covered with gravel or other coarse material that may be at hand, such as cinders, bits of coal, and the like. This covering is from one-half to 1 inch deep, and the sides of the mound are made as steep as the covering material will allow.

The mounds have from one to three funnel-shaped openings, and in a few cases a still larger number, through which the workers pass in and out. The large end of the opening is toward the outside, and the openings are commonly about one-third the distance from the base to the top of the mound. These openings are closed about sunset or during the day at the approach of a storm and opened in the morning about 8 or 9 o'clock in summer. The closing is done so well that a very close examination is necessary to determine where the openings have been.

On hot days in summer the workers return to the mound before noon and remain inside during the hottest part of the day, but on cool days the entire day is spent outside.

^a Compiled from Kansas Sta. Bul. 154.

Under the coarse covering of the mound is a rain-proof roof made of particles of soil cemented together. Beneath this the mound and the soil directly under it to a great depth is honeycombed with circular chambers from 1 to 3 inches across and from one-half to 1 inch high. These chambers are connected by galleries about three-eighths of an inch in diameter and of various lengths. Some of these chambers are filled with seeds of any kind that are small enough for the ants to carry and that are near to the mound; other chambers are occupied by the young in various stages of growth; and still others serve as rooms for the adult ants.

The ants are of three classes—males, fertile females, and sterile females; the latter is the working class and is by far the most numerous. It is estimated that large colonies may have 10,000 workers. The ants vary in length from three-sixteenths to seven-sixteenths of an inch. All the females have large mandibles and stings.

These ants are not pests in the usual sense of the word; as long as the country which they inhabit was sparsely settled they did no harm. Since the country has become more thickly settled, so that they come into close contact with man, they have become a source of annoyance.

The ant colonies are usually too scattering materially to decrease the yield of any important crop. Even in alfalfa, where the damage occasions most complaint, they are chiefly troublesome as an obstacle to harvesting. In a $7\frac{1}{2}$ acre field at Hays City, Kans., thirty-four colonies had cleared a space amounting to between 1 and 2 per cent of the total area, and most of them had constructed mounds of sufficient size to compel the mowing machine to pull around them. To attempt to mow through or over them would have choked the machinery and ruined the cutting edge of the sickle. Should a driver have such trouble in passing over a mound it would be most unwise for him to stop and try to adjust his machinery, for such a disturbance would bring the ants forth in angry swarms, each individual eager to do her utmost to repel the invader. Every one that succeeded in getting on man or beast would seize clothing, hair, or skin between her mandibles, curve her abdomen downward, and deliver a thrust quite as painful in result as the sting of bumblebee or yellow jacket.

Even if the mounds be leveled some days before the cutting, the difficulty is merely lessened, for the passage of the team and machine over the nest is sufficient to bring the ants out in readiness to attack when the intruder comes around again. To a less degree the same difficulty is experienced in raking and loading the hay.

In the dooryard the ants not only render the lawn unsightly with their mounds but unhesitatingly attack the careless child who walks over or plays about their nest. In trodden paths the passage of man or beast is sufficient to bring them out ready for any unfortunate that may follow soon after, and in corrals their determination to defend their rights is a source of annoyance to stock.

The authors' study has failed to find any effective natural enemy of the ants, and a trial of various methods of killing them shows that fumigation with carbon bisulphid is the most satisfactory. The method is described as follows:

Carbon bisulphid is evaporated under a practically air-tight vessel over one or more of the opened gateways of the mound. The vapor formed, being heavier than air, sinks downward through the burrows into the lowest parts of the nest and finally

comes to fill every chamber and passageway. Thus all the ants that are at home are suffocated. Many nests so treated were carefully opened to the lowest chambers and all the occupants found dead beyond possibility of doubt. Some nests were not opened until the next day after the fumigation and then not a living ant could be found. The following method of using carbon bisulphid has proven the easiest and most efficient tried. Start fumigation when gateways are open; take a vessel, such as a galvanized-iron washtub, and place it bottom side up in such a manner as to cover the openings and as much of the mound as possible; if there are more openings than the tub will cover they should be closed by throwing some of the surrounding soil over them; place under the tub, in a shallow pan or dish, near the opening, 1 to 3 ounces of carbon bisulphid, depending on the size of the nest; quickly pack soil around the edge of the tub, making it as nearly air-tight as possible; allow to stand thus for about five hours. The experiments show that breaking open the mound before setting the fumigation is of no advantage, nor did the practice of pouring the fluid into the broken-up mound give any better results than that of evaporating it from a shallow pan.



FIG. 3.—Square cement silos connected with barn. Not proper shape and too shallow.

It should be noted that carbon bisulphid is explosive and care should be observed in its use.

Since the reproducing members of the colony remain in the mound at all times, the above method would seem to be all that could be desired.

EFFECT OF GLASS, METALS, ETC., ON COAGULATION OF MILK IN CHEESE MAKING.^a

One important problem with which the cheese maker has to deal is the irregularity in the coagulation of milk with rennet. This irregularity may be traced to a number of sources, such as variation in the strength of rennet extract used, the quality of the milk, and the kind of utensil employed. Experiments were made by G. A. Olson, of the

^a Compiled from Wisconsin Sta. Rpt. 1907, p. 134; Bul. 162.

Wisconsin Station, to discover the effect of different metals (platinum, tin, copper, nickel, iron, aluminum, and zinc) as compared with glass on the length of the coagulation period. "The experiments were conducted by placing milk in contact with [the] various metals for definite periods of time and afterwards observing the time required for the coagulation of such milk, with a standard solution of rennet, under uniform conditions." It was found that with the single exception of aluminum each of the metals tried produced a prejudicial (retarding) influence on the rennet action. The most striking influence observed was in the case of milk in contact with pure nickel. Milk which had stood in contact with this metal for twenty-five hours at 87° F. required four hundred and twenty minutes for coagulation with rennet and showed an acidity of 0.167 per cent. Under the

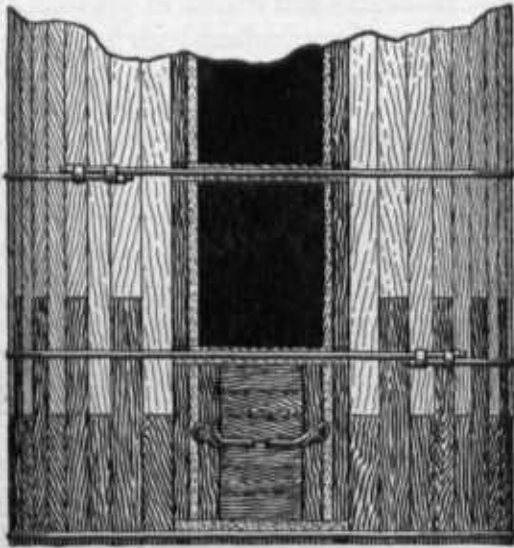


FIG. 4.—A silo with redwood staves at the bottom; cheaper wood above.

same conditions milk in contact with glass required only nineteen minutes for rennet coagulation and showed an acidity of 0.207 per cent. However, as milk is hardly ever kept in nickel or nickel-plated utensils, the retarding effect of this metal has little significance from a practical standpoint. Copper also exerted a decidedly retarding effect, and as this metal is used more or less extensively in the form of heating disks in continuous pasteurizers in creameries and as kettles in the Swiss cheese factories,

its retarding action is a matter of more practical importance. Apparently glass exerted a more or less accelerating influence on rennet coagulation and was to this extent beneficial in action. The degree of effect was directly dependent upon the character of the glass.

THE EFFECT OF RUSTY MILK CANS.

The experiments referred to above showed that both tin and iron have a prejudicial influence on rennet action. This suggested the desirability of determining whether or not rusty cans have a similar influence. Part of a sample of milk was placed in a rusty tin pan (with about fifteen rust spots in the bottom of the pan) and the remainder was kept in a Jena glass vessel (beaker) for comparative purposes. The milk kept in the rusty pan gave evidence of a retard-

ing influence on the rennet action as compared with that kept in the glass beaker. "It required from one to sixteen and one-half minutes longer for the same milk kept in the rusty pan to coagulate than in case of the milk kept in the glass beaker." Wherever there was a retarding influence on the rennet action there was also a retardation of the acid development as well, but the latter was not sufficient to account for the delayed rennet action.

Milk which had been allowed to stand in iron dishes for several hours had a peculiar bluish gray color, indicating the presence of iron in solution. In several instances the amount of iron dissolved in the milk was determined as iron oxid. The maximum quantities of iron dissolved in the milk ranged from 1 to $1\frac{1}{2}$ pounds for every 1,000 pounds of milk. The lower acidity of the milk kept in contact with iron also supports the view that the acid of the milk acts upon the iron and finally causes it to pass into solution [retarding rennet action].

Milk comes in contact with iron in the form of rusty cans or poorly tinned utensils in practically all creameries and cheese factories. The quality of the milk will to a large extent depend upon the condition of utensils into which the milk is poured, kept, and finally hauled to the factory. The degree of influence of iron on milk will depend largely upon the temperature of the milk, the length of time kept in the cans, and the amount of exposed surface.

Conditions in north European dairy countries.—In progressive dairy countries of northern Europe the quality of dairy products manufactured is generally uniform, and every precaution is taken to maintain a uniform product. Cleanliness is generally practiced at both the farm and factory. The utensils used are of superior quality, and naturally there is no occasion to consider this problem seriously. As a rule, the European utensils are stronger; the cans, for example, are of heavy steel and well tinned. Experience shows that these heavy cans are the most economical in the long run, and there is less danger of denting in or wearing off of the tin.

Conditions in America.—It is not necessary to describe here the American milk can, and especially the cheaper ones; if not the first time, surely the second or third time these cans are used one will find places where they have been dented in. As the number of indentations increase the tin begins to crack, leaving fissures or inroads for milk and water and acid. Often this thin layer of tin does not cover all of the iron, thus leaving microscopically small surfaces of iron exposed, which also become the sources of damage by water and acid. Under such conditions the tin peels or falls off, and it is then only a short time before the cans become unfit for use.

The attention of the milk producer and the factory operator is called especially to the following points:

(1) A better grade of utensils should be used in the handling of milk and its products. The iron or steel plate should be heavier and more thickly coated with tin.

(2) No milk should be accepted at a factory which has been kept in iron exposed pails or cans.

(3) The factory or creamery should be an example of neatness and cleanliness, with all utensils in first-class condition.

(4) Cooperation among the proprietors of creameries, cheese factories, and city milk supplies will tend to bring about cleanliness among patrons and the use of better utensils.

(5) Milk should be bought on its merits, by some satisfactory arrangement following well-founded sanitary and hygienic rules, by which the production of milk of superior quality is encouraged and milk of low grade either rejected or gradually improved.

THE EFFECT OF ALKALI ON CEMENT STRUCTURES.^a

E. T. Tannatt, of the Montana Station, and W. P. Headden, of the Colorado Station, have recently called attention to certain facts observed in the course of their investigations which have a very important bearing on the use of cement in farm structures, a use which has rapidly grown with the increasing scarcity and advancing price of timber, viz, the action of alkali on the cement used in concrete structures.

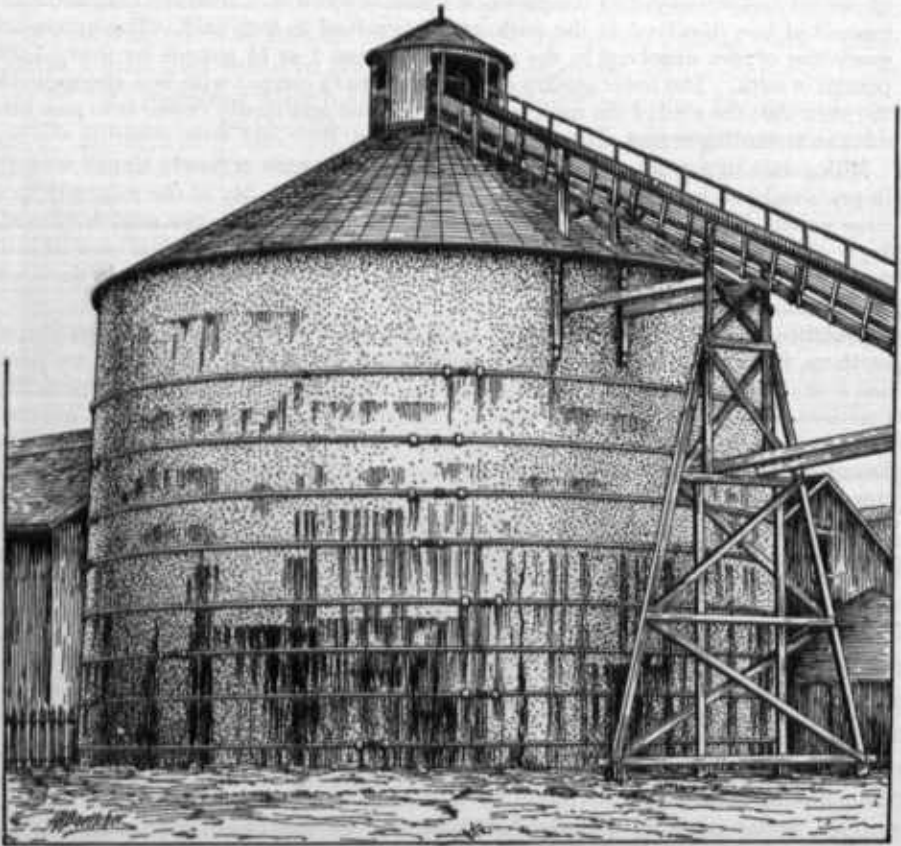


FIG. 5.—A large concrete silo which failed.

Professor Tannatt says.

Cement is being generally used for the construction of culverts, flumes, bridges, foundations, retaining walls, curbing, etc. It has also been largely used in various parts of the canals, conduits, dams, etc., constructed by the United States Reclamation Service on their irrigation projects. A large number of the private irrigation and drainage projects of the West also make use of cement construction to a large extent. Conditions are pointing to a more general and larger use of cement in the structural works of the future. This material is also becoming more and more generally used in agricultural construction. In fact, it is difficult to prophesy to what extent cement may enter into the development of the resources of the country.

^aCompiled from Montana Sta. Bul. 69 and Colorado Sta. Bul. 132.

Professor Tannatt cites a number of cases of weakening or breaking down of cement structures due to the action of alkali. As "the distribution of alkali is quite general, being found throughout the arid and semiarid regions of the Western States and in the Great Central Basin," the damage which may result from this cause is of grave importance.

The examinations and chemical analyses (of a cement sewer) reported show that "the amount of disintegration corresponds closely to the percentage of alkali present." It was also found that sandstone is subject to similar disintegration under the influence of alkali. For this reason Professor Tannatt is of the opinion "that the use of sandstone in foundations, and for a couple of feet above the surface, is very inadvisable in the alkali sections."

As means of protection of foundations against the action of alkali it is suggested that—

The ground on the exterior side should be excavated to the bottom of the foundation, the surface of the sandstone should be thoroughly cleaned with steel brushes and washed. Where the cement mortar shows signs of disintegration, the same should be removed and replaced with new material. After the surface of the foundation has been cleaned, the same should be given a good coat of hot asphalt, the coat extending sufficiently above the surface to include the alkali limit [2 feet above the surface]. In the bottom of the trench thus made along the foundation, a small tile should be laid which will drain any water away from the foundation, or into the city sewer. The trench, at least a portion along the face of the foundation, should be back filled with clean gravel or crushed rock to within a foot or so of the surface of the ground; above this may be placed earth for lawn, if desired.

Concrete foundations for buildings are being used very extensively. Where any large amount of alkali is present in the soil, we believe that cement should not be used, unless thoroughly protected from the action of the alkali salts. This should be accomplished by thorough and proper drainage, and the use of some method similar to that suggested for sandstone foundations.

Professor Tannatt also calls attention to the possibility of harmful action of alkali in the case of cement sidewalks.

In the construction of cement walks in the alkali sections, we would recommend that special care be taken to use clean gravel or broken stone. The use of soil in foundation gravel will furnish a means of bringing the alkali in contact with the lower portions of the cement. It is also advisable, we believe, that where the gravel or broken stone foundation is liable to become filled with water, to place a small drainpipe discharging into the gutter. We feel that with the present knowledge of the situation too much care can not be taken to prevent the alkali coming in contact with cement construction, either through the agency of standing water or the capillary action of the soil.

The general recommendation is made that wherever cement construction is used in the alkali sections, a mortar made of granular sand should be used, and the mortar should be of maximum density.

SILO CONSTRUCTION.^a

The general subject of silos and silage has been fully discussed in previous Farmers' Bulletins.^b It is the purpose in this article, mainly on the basis of data reported by a number of the experiment stations, to point out some faults of silo construction which more extended experience has revealed, and to indicate, if possible, how these faults may be corrected and the general construction of silos improved, for, while it is generally conceded, by dairymen particularly, that the silo has become a necessity, occasional silo failures have discouraged the use of silage to some extent.

FAILURES OF SILOS.

Some of the failures of silos have been due to carelessness in filling, but more frequently to faulty construction of the silo.

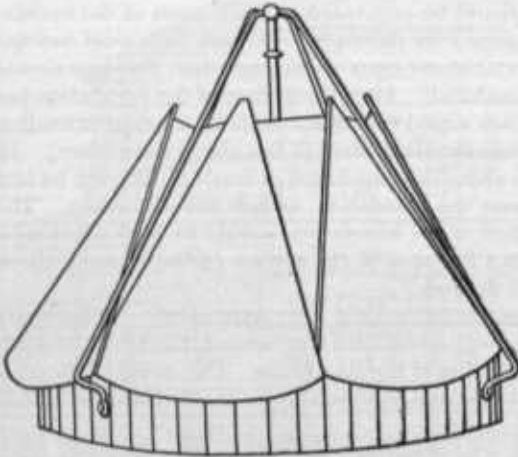


FIG. 6.—The patent roof of a silo, open.

Formerly many silos were made by sheathing one of the bays in the barn. With these silos and other forms of wooden square silos a lining must be built across the corners and the silage well tramped down along the edges or there will be considerable loss of what would otherwise be valuable stock feed. This style of silo, however, has become less common, and but few square silos of any kind are built at the present

time. Even when silos are built inside of a barn they are often circular. Figure 3 shows a square silo that can not be recommended, not only because it is square but because it is not deep enough. The octagon silo is an improvement over the square form, but as a rule the walls of this form of silo have not been made rigid enough. The details for constructing the octagon silo were given in a previous Farmers' Bulletin.^c

Too often the walls of silos are not made air-tight. Unless the walls of wooden silos are made air-tight, with tar paper, felt pads, or clay worked into the joints, much silage will be wasted. Ninety

^a Compiled from Illinois Sta. Bul. 102; Iowa Sta. Bul. 100; Maryland Sta. Bul. 129; Wisconsin Sta. Bul. 125.

^b U. S. Dept. Agr., Farmers' Buls. 32, 292.

^c U. S. Dept. Agr., Farmers' Bul. 190, p. 21.

per cent of stave silos are not air-tight at the foundation. The shrinkage and swelling of staves breaks the cement, which must be frequently mended. Some losses have occurred because the ends of the staves have decayed. Figure 4 shows how some durable wood may be used at the bottom of the silo, which is one method of overcoming this difficulty. The iron bands of the stave silo must frequently be examined, or they will fall down as the staves shrink. Sometimes the iron splices rust. Unless a stave silo

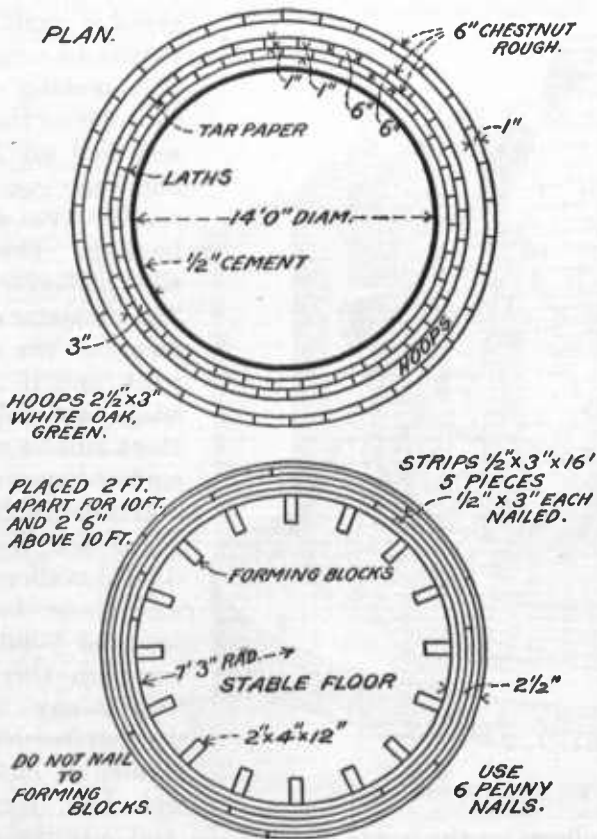


FIG. 7.—Showing method of making hoops and details of the construction of a stone and stave silo.

is well anchored it may be moved from its foundations or even blown down. A further discussion of the stave silo may be found in a previous Farmers' Bulletin.^a

The walls of the silo must be rigid or they can not stand the pressure. Figure 5 is an illustration of a silo, the concrete walls of which were not rigid enough to withstand the inside pressure. When the

sides begin to bulge, air can get between the silage and the walls. Brick silos without reinforcement have been failures because of this pressure from the inside.

A mistake sometimes made was in building the silo of too large a diameter for the size of the herd, so that the silage spoiled by too long exposure of the surface. In one case a man with a small herd built a silo in his barn 18 feet square and 16 feet high. After two years' trial he gave up the use of the silo in disgust because his silage did not keep. A year or two later he sold his farm to a more progressive man, who built

partitions across the same silo, making four small silos out of the large one, and had no difficulty in obtaining good silage for stock. The silos should be deep. The deeper the silo the better the silage. The diameter should conform to the size of the herd, and if 2 inches of silage are fed each day there will be no loss from surface exposure.

It is desirable to prevent silage from freezing. The double wall concrete silo and those built of rectangular building tile accomplish this object as well as any. Stone silos prevent freezing, but many owners of stone silos do not like them because

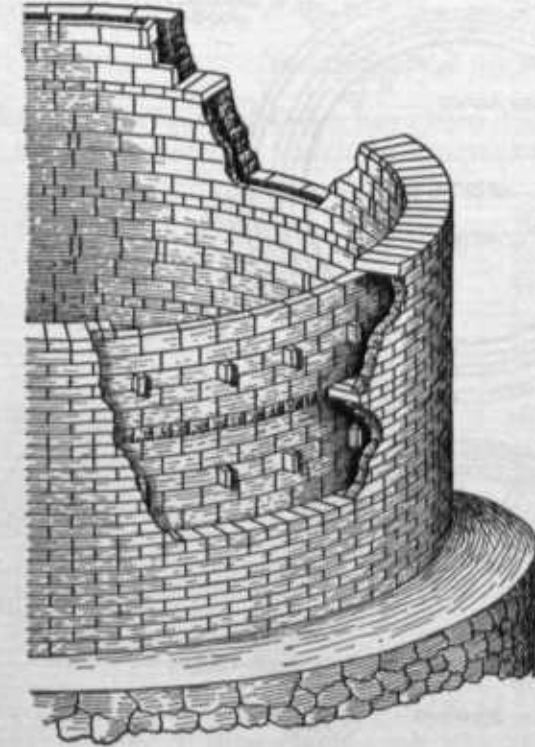


FIG. 8.—Double wall brick silo.

moisture collects on the inside of the walls and rots the silage along the edge. A roof helps to keep out the frost, rain, and snow. Figure 6 shows a patent roof which allows the silo to be filled above the top.

MATERIALS FOR SILO CONSTRUCTION.

Most silos in this country are made of wood, but the high price of lumber has led to the use of other materials for all kinds of farm buildings. Experiment station workers have been investigating the desirability of using earthen and metal substances for silo construction. The cross section of a homemade combination of stone and stave silo in Baltimore County, Md., is shown in figure 7. Staves

20 feet long are set on a stone pit 8 feet deep and 14 feet in diameter, making a total height of 28 feet. The details of construction are as follows:

The staves on outside are chestnut, 6 inches wide, nailed on vertically 16 feet long, and 4 feet nailed above. The 4-foot pieces are nailed on so as to lap on the 16-foot pieces, allowing the water to run off.

The interior is vertically lined with 6-inch chestnut, tar paper placed, and again lined with 6-inch chestnut, joints being broken, then the vertical laths are placed, followed with horizontal, and then plastered with cement. The bottom is cemented in saucer shape. This silo is not affected by atmospheric conditions. The cement is not thick enough to cause it to sweat, and it is as perfect a preserver as the stone silo, there being no decay from sweating. This manner of construction is the only perfect combination silo that was found. The stone and frame work remain flush, thus allowing the silago to settle evenly, which is not the case in the stave silos, as the silo has to be placed in the center of the wall. If placed too near the pit, the shrinkage will allow the hoops to pull the staves to a smaller diameter than that of the pit and thus cause a leak at the foundation, this unevenness allowing the silo to fall or blow over. Every other space between hoops is a door; paper is used between door and joint. Stave silos with hoops ought not to be used as a combination silo.

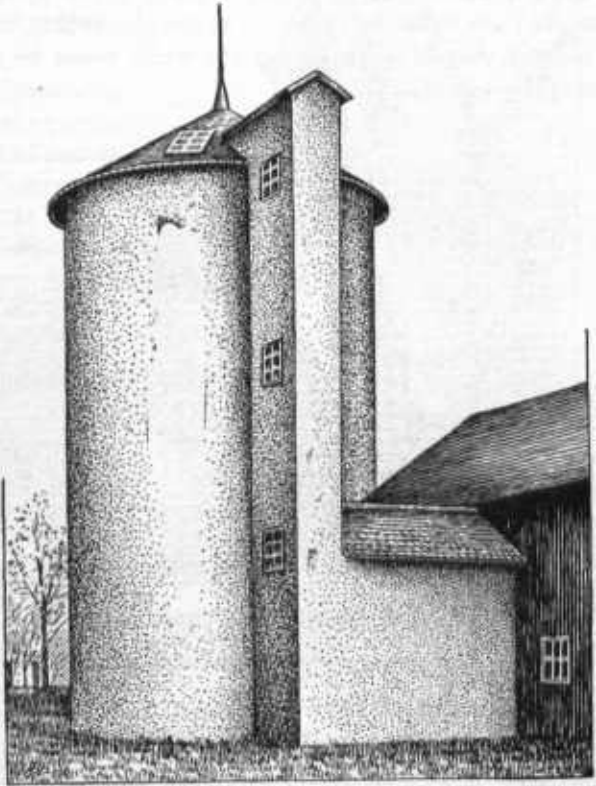


FIG. 9.—Double wall concrete silo.

The following is a list of the material required:

150 pieces $\frac{1}{2}$ inch by 3 inch by 16 foot white oak for hoops.

50 pieces 1 inch by 6 inch by 16 foot chestnut staves } outside.

50 pieces 1 inch by 6 inch by 4 foot chestnut staves }

50 pieces 1 inch by 6 inch by 16 foot chestnut staves } inside first course.

50 pieces 1 inch by 6 inch by 4 foot chestnut staves }

One 16-foot piece nailed from top and 4 foot at bottom. Next stave 16 feet from bottom and 4 feet on top.

900 square feet of tar paper.

50 pieces 1 inch by 6 inch by 16 foot chestnut staves }

50 pieces 1 inch by 6 inch by 4 foot chestnut staves } inside second course.

2,600 rough laths.

20 pieces 2 inch by 4 inch by 16 foot rafters for roof.

200 feet 1 inch by 6 inch sheathing.

2,000 shingles.

18-inch stone wall.

24 perch of stone or concrete.

Doors are concave, built of staves, lined with paper, placed on two concave battens.

It may be questioned whether steel silos will come into general use. Galvanized iron is an excellent method of protecting a wooden silo when located out of doors. Many stone silos have been built, but some care must be taken to make the inside walls smooth. Cement mortar should be used and the walls must be reenforced by building steel bands into the wall.

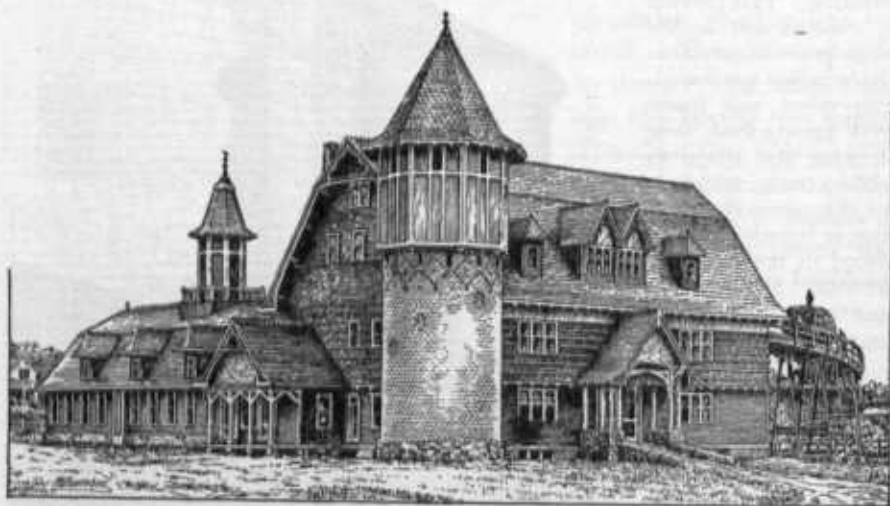


FIG. 10.—Dairy barn and stock-judging building, erected in 1898.

Clay pipe silos are giving good satisfaction, but are expensive. The tubes are set on end with the slots interlocking. Steel bands or hoops are placed around the wall and then plastered smooth with cement plaster. Rectangular building tile is recommended by the Iowa Station as a good material for silo construction. Cement block silos have been satisfactory when reenforced by steel within the walls. The inside of the silos should be plastered. The block is hollow and this prevents freezing. Brick silos are successful, but like the cement block must be reenforced in some way. Figure 8 shows a special form of double-wall brick silos.

The single-wall concrete silo is the most common style of construction. The thickness of the walls of silos now in use varies from 6 inches at the bottom to 4 inches at the top for the lightest wall to a wall 2 feet in thickness, which is the heaviest of which the section has record. Six inches seems to be the most desirable thickness for com-

mon sizes of silos under existing practice. The walls might be made lighter at the top, but the saving of material would hardly balance the trouble of varying the size of the forms. The double wall concrete silo at present is made only with a patented form. Figure 9 illustrates a double wall concrete silo made by forms owned by the Farmers Cooperative Concrete Silo Company. The inner wall is $5\frac{1}{2}$ inches thick, the outer wall $3\frac{1}{2}$ inches thick, and the two tied together with steel ties with a 3-inch air space between. Circulation is prevented by inserting horizontal tar paper partitions every $3\frac{1}{2}$ feet. This construction, besides being as satisfactory as the single-wall method, places it entirely above any criticism in regard to freezing. The patent forms being of steel plate enable a very smooth job to be secured.

THE APPEARANCE OF THE SILO.

The silo as sometimes constructed is anything but an ornament to the farm. The situation and the style of architecture of the other buildings must be considered if the farmer takes pride in making his surroundings attractive. Figures 10, 11, and 12 show what may be done with the silo to make it an ornament instead of a disfigurement to the farmstead.

A CHEAP AND EFFICIENT STERILIZER.^a

In a recent bulletin of the North Carolina Station, Prof. John Michels calls attention to the fact that "all vessels and appliances used in the handling of milk, cream, and butters should be

rendered sterile after washing, either by placing them in boiling water for about five minutes or by steaming them for an equal length of time."

Small dairies without boilers should sterilize with hot water, but the larger dairies will find it advantageous to use a steam boiler and sterilize with steam. To perform this operation efficiently, it requires a closed steam chest large enough to hold everything that is to be sterilized. Sterilizers of this type are usually constructed of concrete, or brick and concrete, and are provided with a heavy iron door, this being large enough to admit a truck bearing the pails, cans, bottles, etc. Still other sterilizers of this type are constructed of galvanized iron or boiler plate, and all permit of sterilizing under more or less pressure.

The principal drawback to these various steam sterilizers is the high cost, which renders their use by the smaller dairymen almost prohibitive. After considerable experimentation and study, the writer has succeeded in constructing an efficient

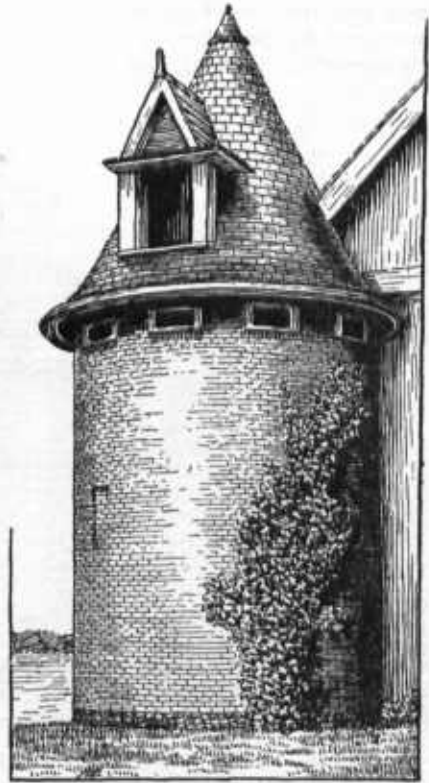


FIG. 11.—Brick silo, Iowa State College.

sterilizer which will cost only about one-third as much as the cheapest sterilizer of the type just mentioned. The construction of this new sterilizer, whose inside dimensions are 7 feet long by $2\frac{1}{4}$ feet deep, by $2\frac{1}{4}$ feet wide, is very simple. (See fig. 13.)

Essentially, it is a rectangular concrete tank with a wooden cover, which is lined with zinc. The sides and bottom are 5 inches thick and are built of concrete, which is made up of one part cement, two parts sand, and two parts coarse gravel. A thin coat, consisting of one part cement and two parts sand, is used as an inside finish. A piece of 2 by 4 studding is placed around the top of the tank and is secured by six $\frac{1}{2}$ -inch iron rods, 2 feet long, embedded in the concrete walls, one being placed at each corner, and one on either side midway between the corners. This arrangement not only strengthens the tank, but also makes the cover fit tighter.



FIG. 12.—A circular dairy barn with silo in center 24 feet in diameter and 45 feet deep.

The cover consists of two thicknesses of $1\frac{1}{2}$ -inch tongued and grooved flooring $3\frac{1}{2}$ inches wide. The upper boards run lengthwise and the lower crosswise of the tank. The lower boards fit into a shoulder projecting from the base of the 2 by 4 studding. The entire inside portion of the cover is covered with zinc. To insure additional tightness of the cover, a layer of asbestos is placed on top of the 2 by 4's. A safety valve, set at 10 pounds pressure, is inserted through the top of the cover at the most convenient place. An outlet for condensed steam is provided at the bottom.

The cover is raised and lowered in the same manner as that of the ice box described on page 29. The cover is strengthened by running three pieces of 2 by 4 studding crosswise of the tank, one at the middle and one at either end. The hinges, by which the cover is fastened, are attached to these 2 by 4 pieces, as shown in figure 13.

The following is an itemized statement of the approximate cost of the material of this sterilizer when the inside dimensions are: Length, 7½ feet; width, 2½ feet; depth, 2½ feet:

2 barrels of Portland cement.....	\$5.20
20 feet of 2 by 4 studding.....	.30
110 feet of 1½ tongued and grooved flooring, 3½ inches wide.....	4.40
4 hinges.....	.40
5 pounds nails.....	.20
6 ½-inch iron rods 2½ feet long.....	1.20
3 hasps.....	.30
20 square feet zinc.....	1.75
Ball and lever safety-valve.....	1.00
3 pounds sheet asbestos.....	.30

Total..... 15.05

The more extended use of efficient sanitary appliances on the farm should be encouraged, and this is most effectively done by indicating, as Professor Michels does in this case, cheap and simple methods of constructing such appliances. More sanitary methods of handling articles of food and drink would be more practicable and more generally used on the farm if some such convenient means of sterilizing appliances and utensils as Professor Michels describes were always at hand.

A CHEAP AND EFFICIENT ICE BOX.^a

There is probably no need which is so severely felt on many farms, particularly in the South, as that of suitable cold storage for the preservation of meat, dairy products, and other food supplies, and as Prof. John Michels, of the North Carolina Station, points out, "cold storage of some kind is indispensable to a well-equipped dairy. Many, however, lack this essential, probably largely owing to the high cost of commercial refrigerators."

Professor Michels describes the construction of an easily made, cheap, and efficient ice box suitable for dairy purposes as follows:

The construction of the box shown in figure 14 consists essentially of two boxes separated by 1-inch strips placed at intervals of about 1 foot. Double thickness of building paper is placed on both sides of the strips and tacked to the boxes. A

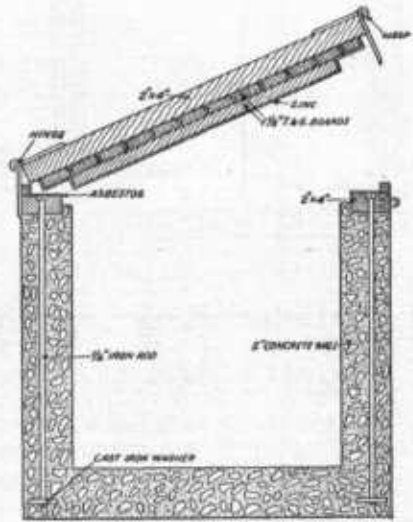


FIG. 13.—Cross section of sterilizer.

^a Compiled from North Carolina Sta. Bul. 198.

1-inch strip 2 inches wide covers the upper space between the 1-inch strips, thus making a dead-air space between the two boxes. The construction of the cover is the same as that of the bottom, with the exception that there is a flange at the front and sides of the cover.

The sides, bottom, and cover of the refrigerator are built of $\frac{3}{4}$ -inch tongued and grooved lumber $5\frac{1}{2}$ inches wide. The ends are constructed of $1\frac{1}{2}$ -inch tongued and grooved flooring $3\frac{1}{2}$ inches wide. The inside of the ice box is lined with galvanized iron. To insure tightness, a layer of felt is tacked around the box and cover where the two meet. The four vertical edges of the refrigerator are tightened and strengthened by tacking over each a double layer of paper, which is covered with two 6-inch beards.

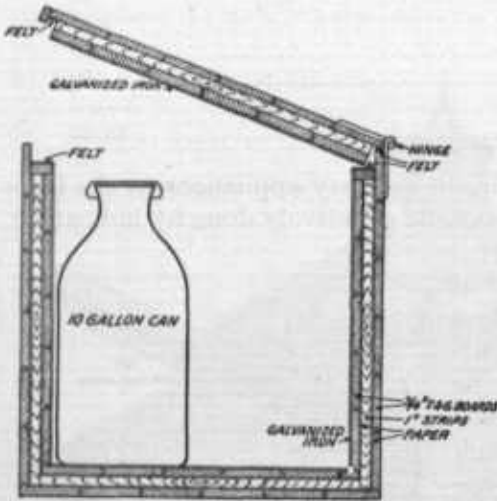


FIG. 14.—Cross section through ice box.

A heavy weight attached to a $\frac{3}{4}$ -inch rope running over a pulley fastened to the coiling raises the cover and holds it open when desired. A short piece of rope with a hook attached is used to counter-balance the weight by hooking to the side of the box, thus allowing the full weight of the cover to rest on the box.

A short piece of $\frac{3}{4}$ -inch gas pipe is inserted through the bottom of the box to provide drainage, the outlet of this pipe being immersed in a cup of water to prevent entrance of air into the box.

The entire construction of the ice box is so simple that anyone with a little knowledge of carpentry can readily build it.

The inside dimensions are: Length, $7\frac{1}{2}$ feet; width, $2\frac{1}{2}$ feet; depth, $2\frac{1}{2}$ foot. An itemized statement of the cost is as follows:

200 feet $\frac{3}{4}$ inch by $5\frac{1}{2}$ inch by 16-foot tongued and grooved lumber.....	\$4. 00
54 feet $1\frac{1}{2}$ inch by $3\frac{1}{2}$ inch by 16-foot tongued and grooved lumber.....	2. 16
168 feet 1 inch by 1 inch by 12-foot strips.....	1. 26
4 hinges.....	. 60
$\frac{1}{2}$ yard felt.....	. 63
15 feet $\frac{3}{4}$ -inch rope.....	. 30
2 strong hooks.....	. 10
1 2-inch iron pulley.....	. 50
Carpentry work, 3 days.....	6. 00
Complete lining with galvanized iron.....	11. 25
500 square feet building paper.....	. 60
Total	27. 40

Commercial refrigerators of equal capacity and no greater efficiency will cost from \$60 to \$100, or about three times as much as the refrigerator above described.

A test of this ice box for six days with an average of 200 pounds of ice in the box showed that an average temperature of 39° F. was maintained within it, with an average daily consumption of $40\frac{1}{2}$ pounds of ice, while the temperature of the room in which the ice box was kept averaged 74° F.

When 22 gallons of milk, which had been cooled to 45° F., were stored in the box eight hours daily with the other conditions as above, the average daily ice consumption for six days was 49 pounds, and the average temperature of the box 40° F.

While this box is designed especially for dairy use, it may easily be adapted to other cold-storage purposes, and so extend its usefulness on the farm.

THE POWER LAUNDRY FOR THE FARM.^a

In an extended article recently prepared for the State Dairy and Food Commission of Missouri by Prof. R. M. Washburn, who was then commissioner, valuable suggestions are made for the planning and convenient construction of barns with reference to location, hygienic conditions, interior arrangement, and conveniences. Special stress is laid on the use of power for running a feed mill and other appliances, and the use of boilers for supplying hot water and other similar equipment essential for satisfactory dairy farms. The modern cleanly, convenient, and hygienic dairy barn means a great deal of additional work for the farmer's wife and her helpers, for white suits must be washed and there is a general increase in laundry work and similar work. It is only just that these added burdens should be offset by more conveniences and labor-saving devices. In general, it is not true that the farm home has kept pace with the rest of the farm in the adoption of improved methods of labor-saving devices and other conveniences.^b

Professor Washburn's plans for a model dairy barn include a laundry, and interesting figures on the cost of equipment, the length of time the equipment may be expected to last, and similar matters are given. It has been suggested that a laundry such as he proposes might be used by a number of families in the neighborhood on the payment of a small fee and prove of great value to the adjacent farm community. Such ideas of cooperation applied to rural life are interesting as well as valuable and an indication of a means by which the farm housewives' labors may be lessened in a number of ways. A cooperative bakery or laundry seems as practical as the cooperative creamery which is now so common.

Professor Washburn writes on the subject of the farm laundry as follows:

A laundry provided with stationary washtubs, with washer and wringer for power use, is an innovation. But why should not the woman of the farm be provided with modern appliances? Why should she be compelled to toil as her great-grandmother did? The farmer no longer reaps with a sickle, or even with a cradle. He rides his plow, and often his harrow. He rides his grain drill and corn planter and corn cultivator. He rides his grain harvester and his corn harvester. He loads hay by machinery and pitches it into the barn by horse power. The time is come when it

^a Compiled from Ann. Rpt. State Dairy and Food Commissioner Missouri, 1 (1907), pp. 129-165.

^b The general question of conveniences in farm homes has been discussed in Farmers' Buls. 270, 296, 317, and 342.

is positive cruelty to compel, or even allow, the woman to toil on without running water or machine power in the house. The same steam, water, and sawage system that must be present for the dairy will take care of the laundry. The same power used for grinding feed and separating milk and pumping water and sawing wood will turn the washer and the wringer. Prices will vary somewhat, but the following will be a guide to the cost of equipping such a room:

Equipment and cost of a farm laundry.

Equipment.	Dimensions.	Horsepower required.	Length of service.	Approximate cost.
Stationary tubs.....	3 compartments, each 28 by 25 by 17 inches.	.....	20 to 30 years....	\$30
Power washer.....	24 by 32 inches.....	One-half....	10 to 15 years....	55
Power wringer.....	18 by 24½ by 30 inches..	.....do.....	15 to 20 years....	40
Piping and connections.....	.....	.....	10 to 20 years....	5
Drying room (1-inch steam piping).....	.....	.....	.....do.....	10
Total.....	.....	.....	.....	140

The investment of \$140 for one year at 7 per cent equals \$9.80; deterioration, assuming that they will require to be replaced every fifteen years, equals \$9.35 per year, or a total of \$19.15, or, say, \$20 per year, or 38 cents a week; add to this 10 cents more for gasoline used by the engine. If the farmer were compelled to kill and dress two hogs every week throughout the year he would think nothing of spending 50 cents a week for machines which would save so much labor and enable him to do more work in less time. A power ironer costing about \$60 may be added, if desired. Such a laundry is to be desired, also, because it will practically insure clean garments worn by the milkers. A drying room, about 6 by 12 feet, located between the dairy room and the laundry room, provided with steam pipes for heating, will cost very little, and will insure quick, clean, and easy drying in any weather. A power laundry like this may be rented to the neighbors for, say, 50 cents per day, they to come over and do the work. Such an arrangement will in a measure lighten the burden now resting so heavily on the woman of the farm.

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